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A Lot of Computer for a Little Money

COMPUTERS IN EDUCATION—
FOR ALL AGES AND ALL PURPOSES

A lot of computer for a little money

Cooperation with local private enterprise has made computer capabilities possible for a district that did not have a computer in its budget

By ALICE D. PETERS

John Christensen (left) of District 91 and C. W. Richardson (right), systems analyst with a local business.

Close cooperation with local private enterprise has enabled Idaho Falls District 91, Idaho Falls, to acquire extensive computer capabilities within the limits of a very small budget. Under a special arrangement, the school district leases and operates the computer while part of the analytical and programming work needed to implement business applications on the system is provided by local industrial personnel.

Developing this arrangement was critical to district acquisition of the computer, according to John A. Christensen, coordinator of computer services for District 91. The district's budget, although fixed, had included funds for administrative data processing by an outside service bureau. The goal then was to secure, for no more than the cost of the outside service, an on-site computer system with sufficient capacity to accomplish all administrative data processing tasks for Idaho Falls schools, and, in addition, to carry out effective instructional support in its two high schools and later at junior high and elementary levels.

The principal obstacle to this approach was the initial time for system design and program development for the business applications, which were expected to require 2,500 hours of professional effort at prohibitive cost. One alternative, Christensen explained, was to obtain the computer for its instructional value, then perform the administrative systems and program preparation on a time-available basis. But as the district would still have to pay for outside processing during an extended start-up period, this procedure was discarded as impractical.

Instead, the solution lay in the community, where civic-minded individuals and businesses offered to help design, program and perform data processing duties for the district. The most prominent figure in this effort has been C. Wendell Richardson, an experienced systems analyst who directs the installation, programming and operation of a small business computer system at Bingham Mechanical and Metal Products, Inc., of Idaho Falls. Richardson and Christensen headed a collective effort which resulted in the development of most business applications programs for the new system even before its delivery last December.

Computers in Idaho Falls

"We were already using computers in a limited fashion in our high schools," explained Christensen. "Our objective was to apply computer technology to instruction of many disciplines, beginning with math but extending across the whole spectrum of the elementary and secondary learning process."

The move toward computer assistance in education began with the cooperation of the school district and several outside interests when minicomputers were first introduced in scientific fields. Realizing the tremendous learning potential in computer experience, Wallace Manning, the district's director of curriculum, along with computer experts from local businesses, began looking for funds years ago.

The first computer, a PDP-8/S from Digital Equipment Corporation, was purchased by the district with federal Title III aid and was installed in one of the high schools as a part of a math resource center under the direction of Manning and Christensen. A second computer of the same family was donated for use in the second high school by a local company, Idaho Nuclear Corporation. These units have been used primarily for stimulating independent study in math and computer operation; students in special classes learned to program in a conversational language and also in machine language.

Although numerous committees, associations and individuals lent valuable support in maintenance, supervision and user training for these machines, their limited capabilities prevented attainment of the objective of computer involvement at all levels.

Thus Manning and Christensen began to investigate the possibility of acquiring a larger computer to service both business office and classrooms. Richardson and other outside experts assured the district that this approach was

indeed feasible at very minimal increases in then current budget figures. Harmon J. Groesbeck, director of business and operations for the district, was willing to try the experiment in collaboration, even knowing that the system under consideration was not business-oriented and that little or no business software had been developed for it.

Plan to make it possible

Having worked out the plan to use savings from service bureau processing to offset the cost of leasing the equipment, the group selected a Digital Equipment PDP-11, configured with a 28,000 binary-word main memory, two magnetic disk data storage devices, a high-speed printer, punch card reader, magnetic tape data storage units and six terminals. Two terminals are located in each high school; the other two are used for business and administrative applications in the computer center.

The magnetic "DECtape" units record on and read from miniature, inexpensive reels of tape, allowing each student using the computer system to store his own files and programs on his own tape for use throughout the academic year. One disk file is used primarily for instruction; the other contains district accounting information.

Elimination of outside business processing of district work recovers leasing and maintenance fees. The only added expense is Christensen's time, divided equally between administrative and instructional applications.

Obviously, the special degree of cooperation between public and private concerns which enabled rapid implementation of the dual "business plus instruction" system required the understanding and support of a board of education sympathetic to the aspirations of the system's proponents. With the chief industry in the Idaho Falls area represented by a large Atomic Energy Commission nuclear reactor test facility, the community and the school board have long shown a marked orientation toward science and technology. Many board members, including Chairman Dr. Fred Tingey, an atomic scientist, use computers in their own work and understand the value of computer experience in education.

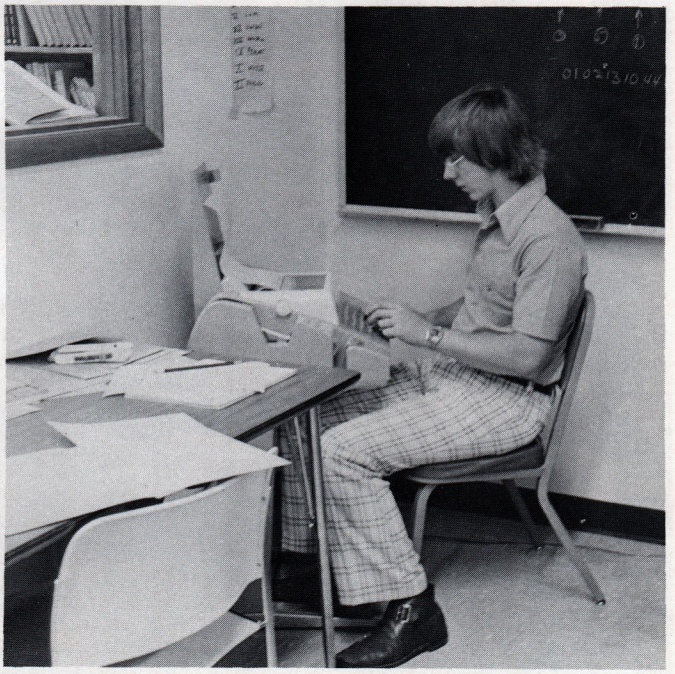
Students, too, grasp the extent of the computer's role in contemporary life, and have made it a standard tool for study. Students who wish to use the system for projects of their own can apply for the status of "computer mini-bum" or "computer maxi-bum." The difference lies in the degree of interest and commitment of individuals. Maxi-bums are assigned more file space within the system and more time at the terminals.

What is being done

At this writing, the district has completed its first semester of experience with the PDP-11. Instructional applications worked out by the faculty and students run a broad gamut. These include:

- Mathematics. In the first area of concentration for use of the new system, students in trigonometry, calculus, algebra, geometry and basic math are given the option of solving problems on the computer. These students participate in a brief training session in use of the BASIC language and are invited to schedule two hours per week of computer terminal time. As an example of instructional support, a program has been developed for quizzing students on powers of numbers. The computer generates a number and invites the student to guess its cube. The computer's response is controlled by the accuracy or margin of error of the student's answer. Messages from the computer are designed to improve students' abilities for estimation and to help them gain an appreciation for the effects of exponentiation.
- Chemistry. A teacher has developed a simulation program in which a student types in a sample chemical formula and the computer determines its validity, based on characteristics of the positive and negative ions input by the student. The computer displays the results of its determination and supplies additional comments on the principles of formulation.
- English. A student has developed a program to format papers automatically before submission to class. Writing projects can be entered into the system, edited as required, then automatically typed at a terminal in correct format. English students are invited to use terminals for this application on an available-time basis.

A 17-year-old student, Robert Huntsman, developed a data-matching program which has been used for both of the district's high schools, for one junior high and for a high school in a neighboring district. According to Christensen, the program is remarkable for its sophistication. Huntsman worked out a system for weighted valuation of characteristics on student questionnaires. Responses are converted to binary numeric values and a number is developed representing the sum of the responses. Date matching is then accomplished by subtracting the total for the individual being matched from all others. The closer to zero the result,



Idaho Falls Board of Education (left) making decisions on basis of information supplied it by computer; student Robert Huntsman at one of the classroom terminals (right) which provide instructional support for schools.

the better the match. The same student has now begun to develop a chess-playing program.

The first programs aimed at junior high and elementary students are complete. High school students developed math teaching programs for use in the regular and migrant 1973 summer school and for continuation during 1973-74. The computer presents the student with a specific problem. He enters his answer and is immediately informed of its accuracy. If there is an error, the computer presents an explanation of the correct solution. In language arts the computer is being used by students for workbook correction.

The business applications, which pay the way for this new instructional tool, represent a formidable accomplishment of their own. Within four months after the computer was installed, the district was running a series of integrated applications, including payroll, accounts payable, budgetary accounting, general ledger and expenditure reporting.

The future

Inspired by these successes, expansion planning for the system was under way before the first full semester of operation concluded. The district's 1973-74 budget contains an allowance for a portable cathode ray tube (CRT) alphanumeric screen display terminal. This unit will be a traveling installation, connected to the computer system from various sites via telephone lines, and will be used to introduce instructional assistance programs at junior high and elementary levels. When schools are closed, the CRT terminal will be brought into district offices for use in file editing.

Looking further into the future, Richardson says that within five years Bingham Mechanical expects to update its own computer system. As its requirements dovetail closely with the school district's needs, the company hopes to develop a configuration compatible with the district's PDP-11 system so that each will be able to back up the other.

Christensen, discussing the future of the computer in education within the district, points out that the present configuration will accommodate up to eight terminals without any compromise in level of service. Some upgrading of the system would be necessary to expand beyond eight terminals. He suggests that time-sharing on the District 91 computer with other school districts could pave the way for expansion, and mentions that community people are acquainting other boards with the advantages of such an arrangement.

"We have a long way to grow yet," Christensen says, "and so do our students. As we can prove educational values, we feel confident our board and our community will remain behind this program." ■

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